WHAT IS CLAIMED IS:

1. An alkaline battery comprising:

a cathode comprising an active cathode material including lambda-manganese dioxide;

an anode comprising zinc;

a separator between the anode and the cathode; and

an alkaline electrolyte contacting the anode and the cathode,

wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff of greater than 290 mAh/g at a discharge rate of 20 mA/g of active cathode material.

2. The battery of claim 1, wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff of greater than 300 mAh/g at a discharge rate of 20 mA/g of active cathode material.

3. The battery of claim 1, wherein the battery has a specific discharge capacity to a 0.8V cutoff of 310 mAh/g or greater at a discharge rate of 20 mA/g of active cathode material.

4. The battery of claim 1, wherein the lambda-manganese dioxide is heated to a temperature of less than 150°C.

5. The battery of claim 1, wherein the lambda-manganese dioxide is heated to at a temperature of 120°C or less.

6. The battery of claim 1, wherein the lambda-manganese dioxide has a B.E.T. surface area of greater than 4 m^2/g.

7. The battery of claim 1, wherein the lambda-manganese dioxide has a B.E.T. surface area of greater than 8 m^2/g.

8. The battery of claim 1, wherein the lambda-manganese dioxide has a total pore volume of from 0.05 to 0.15 cubic centimeters per gram.

9. An alkaline battery comprising:

a cathode comprising an active cathode material including lambda-manganese dioxide having a total pore volume of from 0.05 to 0.15 cubic centimeters per gram, and the lambda-manganese dioxide has a B.E.T. surface area of greater than 8 m^2/g, wherein the lambda-manganese dioxide is heated to a temperature of 150°C or less;

an anode including zinc;

a separator between the anode and the cathode; and

an electrolyte contacting the cathode, the anode and the separator.

10. The battery of claim 9, wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff of greater than 290 mAh/g at a discharge rate of 20 mA/g of active cathode material.

11. The electrochemical cell of claim 10, wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff of greater than 300 mAh/g at a discharge rate of 20 mA/g of active cathode material.

12. A method of manufacturing an alkaline battery comprising:

providing a positive electrode including an active cathode material including lambda-manganese oxide; and

forming a battery including the positive electrode and a zinc electrode,

wherein the active cathode material has a specific discharge capacity to a 0.8V cutoff of greater than 300 mAh/g at a discharge rate of 20 mA/g of active cathode material.

13. The method of claim 12, wherein providing the electrode includes preparing lambda-manganese dioxide by a method comprising:

contacting water with a compound of the formula $Li_{1+x}Mn_{2-x}O_4$, wherein x is

from –0.02 to +0.02;

adding an acid to the water and compound until the water has a pH of 1 or less;

separating a solid from the water and acid; and

drying the solid at a temperature of 120°C or below to obtain the lambda-manganese dioxide.

14. The method of claim 13, wherein the compound has a B.E.T. surface area of between 1 and 10 m^2/g.

15. The method of claim 13, wherein the compound has a total pore volume of between 0.05 and 0.15 cubic centimeters per gram.

16. The method of claim 13, wherein the compound of the formula $Li_{1+x}Mn_{2-x}O_4$ has a spinel-type crystal structure.

17. The method of claim 13, wherein the solid is dried at a temperature of less than about 100°C.

18. The method of claim 13, wherein the solid is dried at a temperature between 50°C and 70°C.

19. The method of claim 13, wherein x is from –0.005 to +0.005.

20. The method of claim 13, wherein contacting water and the compound includes forming a slurry.

21. The method of claim 20, wherein the slurry is maintained at a temperature below 50°C.

22. The method of claim 13, wherein the acid concentration is between 1 and 8 molar.

23. The method of claim 13, wherein the acid is sulfuric acid, nitric acid, perchloric acid, hydrochloric acid, toluene sulfonic acid, or trifluoromethyl sulfonic acid.

24. The method of claim 20, wherein the temperature of the slurry is maintained substantially constant during the addition of acid.

25. The method of claim 13, wherein the pH is 1 or less.

26. The method of claim 13, further comprising washing the solid separated from the water and acid with water until the washings have a pH greater than 6.